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Planuloid budding from a cutting plane of polyp stalk of *Cassiopea* sp. (Cnidaria, Scyphozoa)

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Abstract *Cassiopea* polyps that appeared in culture vessels of *Turritopsis* sp. polyps at the Seto Marine Biological Laboratory, Kyoto University in 2014 were experimentally amputated their stalks from the calyxes. On the cutting plane, planuloid buds were exclusively produced and stalks were never regenerated. Planuloids became polyps but some of them were never produced stalks. It is assumed that the polyp that accidentally lost its stalk has a chance to raise their survival rate by releasing multiple of planuloids**.**

Keywords: amputation experiment, calyx, *Cassiopea* polyp, planuloid, stalk

Introduction

Cassiopea sp. (Cnidaria, Scyphozoa) is well-known in its unique posture on the seabed with an upside down form of ordinal jellyfish. This medusa inhabits mainly in tropical sea, and in Japan it is distributed over south of southern Kyushu and does not appear around Honshu (Miyake and Lindsay, 2013; Kubota, 2014). *Cassiopea* produces planulae by sexual reproduction as an ordinary medusa. It is also known that it is propagated by producing planuloids from a calyx (Uchida, 1961; Curtis and Cowden, 1971, 1972; Hofmann et al., 1978; Miyake and Lindsay, 2013).

Recently more than 15 *Cassiopea* polyps suddenly appeared in culture vessels of *Turritopsis* sp. polyps at the Seto Marine Biological Laboratory, Field Science Education and Research Centre, Kyoto University in July 2013 (Fig. 1). One individual of the *Cassiopea* polyps was accidentally injured between its stalk and calyx. It is then amputated itself. Planuloids were produced and released one after another from the calyx of this polyp without stalk. The polyp that lost its stalk did not regenerate this structure, but reproduced asexually as a unique method. Therefore we carried out an amputation experiment and reported these results.

Material and Methods

By releasing ephyrae we were able to confirm that these scyphopolyps (Fig. 1) were one of the species of *Cassiopea* (although not to species level) that we did not have any records of witness or capture in the area of seacoast at Shirahama, Wakayama Prefecture (Kubota, 2014). It is assumed these polyps possibly originated from the planulae carried by the Kuroshio current and had intruded from an external pipe to the aquarium.

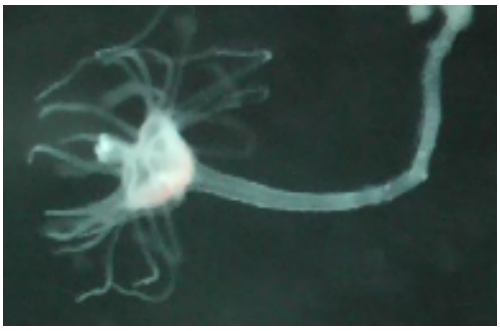

Figure 1. *Cassiopea* polyp that appeared in a breeding aquarium at the Seto Marine Biological Laboratory, Field Science Education and Research Centre, Kyoto University.

Beginning of August in 2013, three *Cassiopea* polyps were picked up from culture vessels of *Turritopsis* sp. (cf. Kubota, 2011) and kept them in a 30 mm diameter, 15 mm height polystyrene cylindrical vessel using the stagnant water (5 μm-sieved natural seawater) at 26°C and fed them hatched *Artemia* nauplii. Then they were experimentally amputated their stalks from the calyxes by sharpened stainless needles (Fig. 2, left) and observed the following phenomena for about at least nine months.

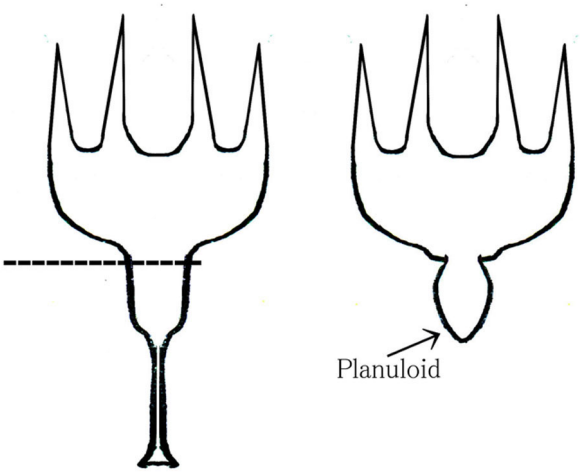

Figure 2. Amputation of *Cassiopea* sp. polyp between its stalk and calyx (left: amputated at the dashed line) and the budding of a planuloid (right).

Results and Discussion

Planuloid bud was exclusively produced from a cutting plane of polyp calyx (Fig. 2, right; Fig. 3), and such a budding had never reported elsewhere (Curtis and Cowden, 1972). The lost stalk was never regenerated as described before by Curtis and Cowden (1972). All the free-swimming planuloids attached to a breeding vessel and grew to polyps. These polyps could have been kept at least in May 2015. Not all but some of these grown polyps were never produced stalks. This is partly due to the presence of suitable bacteria film on the rearing vessel as was pointed out by Hofmann et al. (1978).

Normally the planuloid buds at the side of their polyp calyx with stalk (Uchida, 1961; Curtis and Cowden, 1971, 1972; Hofmann et al., 1978; Miyake and Lindsay, 2013), but the buddings observed in the present study were always different, i.e. from a cutting plane of polyp calyx (Fig. 2, right; Fig. 3). Amputated two body

portions, the upper calyx and the lower stalk, never regenerated their lost parts, according to the former observation by Curtis and Cowden (1972) for the calyx but not for the stalk, though sample size is small in the present study.

From these preliminary observations and experiment in four polyps, it is assumed that the polyp that accidentally lost its stalk in the nature have a chance to raise their survival rate by releasing multiple of planuloids, even if their mother body can not completely regenerate.

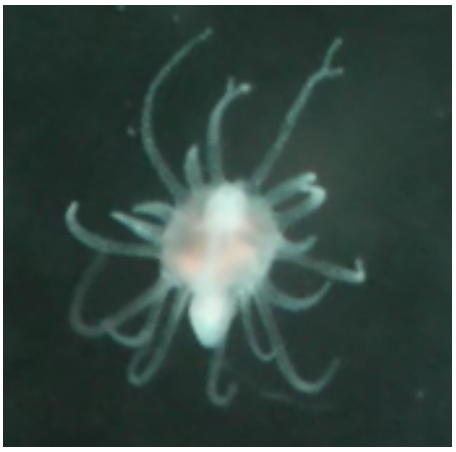

Figure 3. Amputated *Cassiopea* polyp budded a planuloid from the cutting plane of calyx.

Acknowledgments

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